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Participatory design and participatory making in a FabLab: challenges for users and designers

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Abstract

This article explores self-fabrication by novice participants in a FabLab for a Participatory Design (PD) research project 'Bespoke Design'. We developed bespoke tools for self-managing diabetes specifically related to one person's everyday experiences. Instead of the strictly medical top-down approaches, combining bespoke designs with PD and self-fabrication is more in line with the fact that people with diabetes use these tools 24/7. Being experts on using these tools we involved three participants with diabetes in the design of bespoke prototypes for each of them. To facilitate re-designing these tools to other people's wishes and needs, we shared documentation of the prototypes development and conducted these processes in a FabLab. In this way participation of the participant extends to the concrete making or fabrication process (Seravalli, 2013), instead of restricting participation to the exploratory, conceptual making phase (Ehn & Badham, 2002). While this sounds promising, we experienced that involving novice users in the fabrication of prototypes is challenging. We describe the development of a series of prototypes for one participant and inventory the related challenges to start a discussion about the FabLab as a place for participatory design and participatory making and how this affects the role of a designer in a project.

Keywords: Participatory Design, participatory making, FabLab, diabetes

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Introduction

FabLabs - Fabrication (or Fabulous) Laboratories - are "*collection[s] of commercially available machines and parts linked by software and processes [...] developed for making things*" (Gershenfeld, 2005, p.12), allowing developing and perfecting a prototype of almost any product. These open-source fabrication spaces (Seravalli, 2011) are frequently introduced as leading us towards the next industrial revolution, proposing expectations for making products easily and locally by allowing accessible forms of personal fabrication (Mota, 2011). Personal fabrication or fabricating product ourselves instead of shopping for them (Gershenfeld, 2005) is made possible because of recent advances in 'Open Source' electronics and personal fabrication possibilities such as 3D-printing (Ananthanarayan, Lapinski, Siek & Eisenberg, 2014; Mota, 2011).

We explored these premises of a Fablab and personal fabrication within the project Bespoke Design, wherein we developed self-management[1] tools for and with people with type 1 diabetes, who use these tools for continuously managing their condition (Funnel & Anderson, 2004; Wootton, 2000). The project follows the tradition of Participatory Design (PD), involving end-users as full participants in the design process, (potentially) leading to a feeling of shared ownership of the final product (Ehn & Badham, 2002; Robertson & Simonsen, 2013). We involved people with type 1 diabetes from the first step of the process, exploring the everyday life with diabetes and ways to self-manage this condition. PD approaches are usually limited to this conceptual phase. However, in Bespoke Design we extended participation to the making phase; resulting in a process of participatory making (Seravalli, 2012; 2013). To execute this participatory making phase and allowing others to redesign the developed tools after project completion, we prototyped the different tools in FabLab Genk (BE). While the context and open philosophy of a FabLab theoretically allows for extending the possibilities for participation in a design project, we learned that this is not a simple process. By describing a specific case, we reflect on the challenges of a FabLab for PD and participatory making projects and how this affects the role of the designer.

Developing bespoke prototypes in a FabLab

By describing the development process of a series of prototypes for Bill[2], a male triathlete with type 1 diabetes, we investigate the challenges of a FabLab for developing bespoke prototypes. Bill wanted to wear his self-care tools (glucometer and lancet pen) close to his body when sporting

[1] Managing diabetes requires both self-care as self-management. Self-care relates to independent care (e.g. injecting insulin) while self-management entails the necessary organizational framework to conduct self-care actions (e.g. carrying your tools with you).

[2] A pseudonym is used because of privacy issues.

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and find a solution for the long and impractical thread for the catheter. Bill's collaboration with the team's product designer evolved from mapping his everyday experiences when carrying and using his tools to developing a series of prototypes. Using the 3D printers of FabLab Genk, they iteratively developed a series of two 3D-printed prototypes (Dreessen, Schoffelen, Leen & Piqueray, 2014), i.e. a system to roll up the thread for the catheter (Figure 1) and a clip system to attach Bill's self-care tools to his body (Figure 2). The technique of 3D-printing supports a rapid prototyping process of different iterations of making, testing, re-making, re-testing (i.e. a process of trial-and-error). Moreover, 3D-printing allows for easily creating detailed designs (in terms of resolution and finishing). Bill designed and printed a first prototype together with the product designer and intensively used and evaluated the tools (i.e. design, use and look) during an in-depth interview with the designer (in his home and through phone and email conversations). We will reflect on the potential role of FabLabs for PD and participatory making projects and the related challenges we experienced in Bespoke Design. These challenges relate mostly to three main issues: the lack of knowledge and skills and the investments in time and money.

Figure 1: roll up system

Figure 2: clip system

First, FabLabs are considered as workplaces where one can easily make an object (Gershenfeld, 2005; Mota, 2011). However, our experience showed the necessity of specific knowledge and skills to use the machines and the need to intensely experiment with them to gain thorough insights in their working and properties (Weichel, Lau, Kim, Villar & Gellersen, 2014). The product designer and Bill had no prior experience with (designing for) 3D-printing. However, the designer's background in product design, together with the knowledge and guidance of the FabLab manager, enabled him to quickly pick up the necessary skills for designing 3D objects (e.g. using Rhino software). Bill's lack of knowledge and skills in 3D-printing impeded him in experimenting with the technology on his own and always required the designer's assistance. This proves that

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personal fabrication and FabLabs are not accessible for everyone, as often believed. Also the novelty of the technique and the different technologies of, materials of and applications for 3D-printing among FabLabs hamper the use of 3D-printing technology in terms of personal fabrication. There is in fact no general open repository that collects information on the different types of printers, the materials, properties, etc., making it impossible for designers and novice participants to have a clear view on the end result of the prototype before printing (Mayson, 2013). Experimentation and trial-and-error are essential parts of design processes, but when working closely with participants they hamper participatory making. Often participants consider trial-and-error as 'faults' and not as valuable input for the design process (Seravalli, 2013). To allow for Bill to redesign his tools in the future or for other participants to redesign and fabricate their own tools, some training or the support of a designer or expert-user is necessary

Second, personal fabrication allows making prototypes without having to produce a whole series and is therefore considered cost-efficient. However, 3D-printing of personalised self-management tools is time-consuming. The printing times are high and the making process requires several iterations, which can strongly increase the costs. Bill's clip system was remade seven times before an adequately functional and testable prototype was obtained (Figure 3). The printing process of the final prototype of this clip system[3] took 4,5 hours at a cost of 20 euros. However, the total cost of printing the different prototypes (i.e. of the clip system and the thread system) was three times higher than estimated.

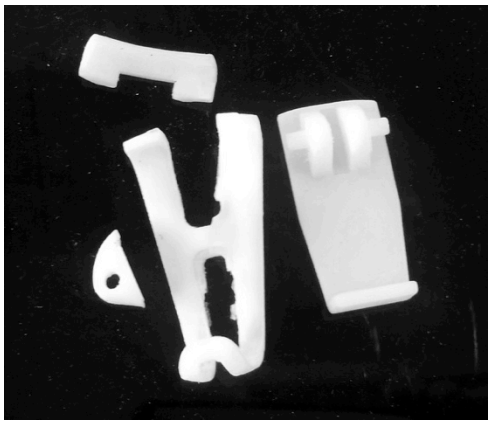

Figure 3: one of the versions of the roll up system

Third, the participatory setting further increased the investment of the designer and participant to develop a set of personalised self-management tools[4]. Although a FabLab, as open research

[3] 103,65 mm x 34,97 mm x 33,26 mm

[4] The product designer and Bill repeatedly met each other and kept on communicating, discussing the use and (re)design of the tools.

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environment, facilitates collaborating in an informal setting, it requires an enormous engagement of the participant to continuously invest time and energy in the design and making process. While this is the case for every PD project, participation in the making process prolongs the period of time that the participant is involved in the project.

Summarizing, we experienced that creating individualised solutions adapted to the needs of one particular person is a long-term process that is costly (in terms of 3D-printing cost) and time-consuming (long printing times and necessary iterations) for both the designer and participant. 3D-printing is not the straightforward, easy and low-cost process as the common rationale dictates. It is in fact - like most prototyping processes - a continuous case of trial-and-error, (re)designing and (re)testing, requiring a lot of input from the designer and participant. Bill was very motivated to participate, although his lack of knowledge and skills on 3D-printing impeded him to actively participate in the making process, exposing implications and new rules for the designer.

Implications and new roles for the designer

Although personal fabrication seems not feasible within the very near future for every single participant, a FabLab as fabrication space is a supportive research environment for PD projects. By developing Bill's tools, the FabLab enabled a close relation between designer, participant and machines, changing the role of the designer as a mediator for participation. While this role of mediator is well known in the conceptual design phase (e.g. Participatory Design), mediating the participatory making of prototypes demands different or additional roles for the designer (Stappers *et al*, 2011; Seravalli, 2013). The product designer explained the concept and philosophy of a FabLab to Bill before involving and guiding him strongly in the making process. But there are additional tasks for the designer in the prototyping process (Seravalli, 2013).

First, the product designer experienced the uncertainty that designers are often confronted with when designing in participatory ways. PD projects are in essence always uncertain since they rely heavily on the input from other participants and therefore have an unpredictable outcome (Huybrechts, Schepers, & Dreessen, 2014). Iteratively developing prototypes increases this uncertainty and requires the designer to explain this iterative process to the participant who is unfamiliar with it (Seravalli, 2013). Although this process demanded a lot of investment from Bill, he valued the gained insights. Thus, besides introducing the practices of prototyping to the participant, the designer has to ensure a continuation of the prototyping process and make it engaging for the participants.

Second, the release of ownership of and giving up control over the project by the designer are central in PD processes (Schepers, Huybrechts & Dreessen, 2011), but come even more to the foreground in participatory making, changing the relation between the designer and participant.

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On the one hand, it can imply a more passive role for the designer: a problem-solving guide aiding participants when necessary. However, the lack of certain skills (e.g. on 3D-printing) and knowledge by participants to redesign and redevelop the tools still demands an active role of the designer. On the other hand, making tangible prototypes creates a more concrete relation between the designer and participant. Bill reflected on possibilities while holding or making the prototypes (e.g. asking for specific functionalities to be included in a prototype), deepening the collaboration between designer and participant.

PD projects always demand an active involvement from the participant without having a clear view on the outcome of the project (Schepers *et al*, 2011; Holone & Herstad, 2013). Training the participants prior to the participatory making helps to overcome the challenges of personal fabrication, i.e. acquiring skills and knowledge, as is already done in some FabLabs. This can even become more valuable when aiming to stimulate participation after project completion. Furthermore, participatory making also requires new approaches, methods and tools on how to mediate the different aspects of participatory making. Existing approaches mainly involve the making and collaborating on a material level, i.e. making tangible prototypes, demanding certain skills from participants. Given the challenges involved, we are also exploring how people can be invited and allowed to participate on an immaterial level (Schoffelen & Huybrechts, 2013; Schoffelen *et al*, 2013).

Conclusion

Although the context of a FabLab and the idea of personal fabrication can be very beneficial for PD and participatory making, some important challenges remain. We experienced three main issues in 'Bespoke Design'. A first obstacle relates to the skills and knowledge for using the FabLab infrastructure. This proved to be a major obstruction preventing Bill from actually making the prototypes independently or even together with the designer. Also, providing insights in the value of trial-and-error making processes, can facilitate the involvement of novice participants. Finally, using personal fabrication technologies (e.g.3D-printing) is not an easy and quick process for prototyping. Due to the relatively high printing cost, the printing time and the different iterations needed to obtain a functional and testable prototype, one can question the use of this technique for developing personalised tools.

Although personal fabrication is not feasible in the very near future we do believe a FabLab can take up the role of a participatory making space, bringing together different sorts of knowledge and skills. Using a FabLab as a research environment for participatory design and participatory making, can stimulate or trigger new users to explore the FabLab, personal fabrication and the technologies enabling this. Additionally, when designers get skilled in mediating these participatory making projects, a transfer of knowledge and skills can further increase the possibilities of PD and participatory making projects within the context of a FabLab.

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Hence, choosing a process of participatory making provides the designer with new roles in these kinds of projects, i.e. a mediator between the participant and the machinery, and creates a more profound relation with the participant. Furthermore, designing in this context expands this mediator-role from conceptual design to the actual making of tangible prototypes. This paper is a small contribution to developing a discourse concerning this new mediating role of designers in participatory making.

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References

ANANTHANARAYAN, S., LAPINSKI, N., SIEK, K., & EISENBERG, M. (2014, June). Towards the crafting of personal health technologies. In *Proceedings of the 2014 conference on Designing interactive systems* (pp. 587-596). ACM.

BALLEGAARD, S. A., HANSEN, T. R., & KYNG, M. (2008, April). Healthcare in everyday life: designing healthcare services for daily life. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1807-1816). ACM.

DREESSEN, K., SCHOFFELEN, J., LEEN, D. & PIQUERAY O. (2014, JULY). *Great expectations and big challenges: a FabLab as facilitator for personal fabrication of tools to self-manage diabetes*. Paper presented on All Makers Now? Craft values in 20th century production, Cornwall, UK.

EHN, P. & BADHAM, R. (2002). Participatory Design and the Collective Designer. In T. Binder, J. Gregory & I. Wagner (Eds), *Proc. Participatory Design Conference (pp. 1-10)*. Malmö, Sweden.

FUNNEL, M. M. & ANDERSON, ROBERT M. (2004). Empowerment and self-management of diabetes. *Clinical Diabetes*, **22**, 123 -127.

GERSHENFELD, N. (2005) *FAB. The Coming Revolution on Your Desktop. From Personal Computers to Personal Fabrication*. New York: Basic Book.

HOLONE, H., & HERSTAD, J. (2013, April). Three tensions in participatory design for inclusion. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2903-2906). AC*M.*

HUYBRECHTS, L., SCHEPERS, S. & DREESSEN, K. (2014). Participation and Risky Trade-offs. In L. Huybrechts (Ed.). *Participation is Risky: Approaches to Joint Creative Processes* (pp. 7-89). Amsterdam: Valiz.

MAYSON, S. (2013). People-Centred Desktop Design and Manufacture: a review of web enabled open source tools for localised community focused inclusive design. *Include Asia 2013: Global Challenges and Local Solutions in Inclusive Design*, 1.

MOTA, C. (2011, November). The rise of personal fabrication. *In Proceedings of the 8th ACM conference on Creativity and cognition* (pp. 279-288). ACM.

ROBERTSON, T. & SIMONSEN, J. (2013). Participatory Design: an introduction. In J. Simonsen & T. Robertson. (Eds.). *Routledge International Handbook of Participatory Design* (pp. 1-17). New York: Routledge.

ISBN 978-1-84387-385-3

SCHEPERS, S., HUYBRECHTS, L. & DREESSEN, K. (2011). MAP-it: on friction, risk and releasing control. *Swedish design research journal*, **2**(11), 32-38.

SCHOFFELEN, J., & HUYBRECHTS, L. (2013). Sharing is caring. Sharing and documenting complex participatory projects to enable generative participation. *Interaction Design and Architecture (s),* **18**(1), 9-22.

SCHOFFELEN, J., HUYBRECHTS, L. & DREESSEN, K. (2013) *Please resuscitate! How to share a project concerning self-management in diabetes to enable participants to elaborate on it after project completion?* Paper presented at Design4Health Conference, Sheffield (UK).

SERAVALLI, A. (2011). Democratizing production: challenges in co-designing enabling platforms for social innovation.In *Proceedings of International Conference on Sustainable Design Strategies in a Globalization Context*. Bejing, China: Tsinghua University

SERAVALLI, A. (2012, August). Infrastructuring for opening production, from participatory design to participatory making?. In *Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases-Volume 2* (pp. 53-56). ACM.

SERAVALLI, A. (2013). Prototyping for opening production: From designing for to designing in the making together. In *Proceedings of the 10th European Academy of Design Conference. Gothenburg,* Sweden: University of Gothenburg.

STAPPERS, P. J., SLEESWIJK VISSER, F. & KISTEMAKER, S. (2011). Creation & Co: User Participation in Design. In B. van Abel, R. Klaassen, L. Evers, P. Troxler (Eds.) *Open Design Now: Why Design Cannot Remain Exclusive* (pp. 140-148). Amsterdam: BIS Publishers.

WEICHEL, C., LAU, M., KIM, D., VILLAR, N., & GELLERSEN, H. W. (2014, April). MixFab: a mixed-reality environment for personal fabrication. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems* (pp. 3855-3864). ACM.

WOOTTON, R. (2000). The development of telemedicine. In: M. Rigby, R., Roberts & M., Thick (Eds.). *Taking health telematics into the 21st century* (pp. 17-26). Abington: Radcliffe Medical Press.

ISBN 978-1-84387-385-3